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Ottawa, Canada
K1A 0C9

(21) (A1) 2,010,543
(22) 1990/02/21
(43) 1990/09/17
(52) 5-27
C.R. CL. 180-10
180-38

5,010,178

(51) INTL.CL.[5] A61G-1/02

(19)(CA) **APPLICATION FOR CANADIAN PATENT** (12)

(54) Motorized Stretcher

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(30) (US) 324,868 1989/03/17

(57) 14 Claims

MID 068 P2

Abstract of the Disclosure

A self-propelled stretcher incorporates a self-contained drive for propelling the stretcher along the floor of a hospital under the guidance of a single attendant who can selectively control both direction and speed of travel of the stretcher. The drive includes a driving wheel mounted for movement into and out of engagement with the floor to facilitate sidewise movement of the stretcher. Provision is also made for releasably latching the drive wheel in its raised position such that positive action is required by the operator in order to release the latching members from their relative positions holding the drive wheel out of engagement with the floor such that positive action is required by the operator to effect such release.

Currently, at least the great majority of stretchers of this type include a chassis having casters mounted at its four corners on which it can be rolled along a hospital floor. Because of the dimension and weight factors discussed above, a minimum of two attendants will be needed to propel and guide such a stretcher, and additional attendants may also be needed in situations where the patient is being treated during transport, such for example as in emergency or delivery situations.

There is therefore a considerable practical need for a self-propelled stretcher that requires only guidance by a single attendant during all transport operations of a supine patient, which will not only reduce the physical labor of transport as well as injuries to nurses, but will also reduce the number of attendants needed for each transport, with resultant reduction of hospital labor costs.

Summary of the Invention

It is the primary object of the present invention to provide a self-propelled stretcher which incorporates a self-contained drive for propelling the stretcher along the floor of a hospital or other place of use under the guidance of a single attendant who can selectively control both the direction and speed of travel of the stretcher, and who is therefore not required to exert any more force than is needed to steer the stretcher in the proper direction.

This objective is achieved in accordance with the invention by equipping the stretcher chassis with a drive unit comprising a driving wheel and a motor for driving the wheel, with all of the drive components being mounted as a sub-assembly in a single support which is in turn so mounted

on the stretcher chassis that the wheel can be readily moved into and out of driving engagement with the floor. In addition, the drive motor is provided with a manual control which is mounted on the stretcher, and which enables a single operator to select both whether the stretcher is to move forward or back, and also the speed of such movement.

Another feature of the invention is that the support for the drive assembly is pivotally mounted on the stretcher chassis, and simple means are provided for moving this pivotally mounted support between lowered and raised positions with respect to the floor. Further, the invention provides a latching assembly which releasably secures the drive assembly in its raised position in response to movement of the drive assembly to that position. This latching assembly also includes provision for preventing release of the drive to its lowered, operative position except in response to positive action by the operator to effect release of the latching assembly.

Other objects and advantages of the invention, and the structure by which they are achieved, will be apparent from or pointed out in connection with the description of the preferred embodiment which follows.

Brief Description of the Drawings

Fig. 1 is a perspective view showing a stretcher incorporating a self-contained drive in accordance with the invention for propelling the stretcher along a floor;

Fig. 2 is a view taken generally on the line 2--2 in Fig. 4 with some parts removed;

Fig. 3 is a fragmentary elevational view looking from left to right in Fig. 2;

Fig. 4 is a fragmentary plan view illustrating the mechanism for latching the drive support in its unlatched position;

Fig. 5 is a view similar to Fig. 4 showing the latch mechanism in latched position;

Fig. 6 is an enlarged fragmentary section on the line 6--6 in Fig. 5; and

Fig. 7 is a schematic wiring diagram.

Description of the Preferred Embodiment

The basic structure of the stretcher shown in Fig. 1 is essentially as shown and described in the commonly owned Kuck U.S. Patent No. 4,691,393. It includes a rectangular bed 10 on which the patient is placed, and this bed is mounted, as described in the above patent, on a chassis indicated generally at 11 which is in turn supported on four casters 12 for movement along the hospital floor.

The chassis 11 includes a main frame plate 13 having one of a pair of cross tubes 14 and 15 welded thereto at the head and foot ends of the chassis respectively. Each of these tubes has a caster 12 mounted at each end thereof in a conventional swiveling mounting in a tubular housing 16, and provided with a foot-operated brake 17 of well-known conventional construction. The frame plate 13 also supports a hollow column 18 within which is mounted the powered system for tilting the bed 10, which may be hydraulic, as described in the above patent, or electrical.

The power unit for propelling this stretcher is identified generally as 20 and is mounted in a frame comprising a pair of side plates 21 and 22 welded to the opposite edges of a cross member 23. The side plates 21-22

are pivotally mounted on the chassis 11 by a cross shaft 25 mounted at its opposite ends in the lower ends of a pair of tubes 26 which extend vertically through and are welded to the foot end chassis tube 15.

The power unit 20 includes a rubber tired driving wheel 30 freely rotatable on a shaft 31, each end of which is supported in a spacer 33 of square section that is in turn mounted for sliding movement in a slot 34 in an adjustment mechanism 35 welded to the outside of the plate 21 or 22 respectively. Screws 36 and 37 threaded through opposite ends of the adjustment mechanism 35 adjust the position of the associated spacer 33 in the slot 34 to tension the drive belt for wheel 30 as now described.

The drive train to the wheel 30 includes a gear motor 40 bolted or otherwise mounted on the frame side plate 21. Satisfactory results for the purposes of the invention have been obtained utilizing a 12-volt, one-half horsepower permanent magnet motor 40 having a gear box reducer 41 which provides a 10:1 reduction by use of helical gears to a drive pulley 42 having a driving connection through belt 44 to a pulley 45 secured to one side of driving wheel 30. As noted in the preceding paragraph, the tension of belt 44 may be changed by adjusting the position of the wheel shaft 31 in the adjustment mechanism 35.

Means are provided for continuously applying a downward biasing force on the drive unit frame 21-23 and thus on the wheel 30 to maintain it in driving engagement with the floor. More specifically, an elongated bolt or threaded rod 50 is welded to the frame cross member 23 and projects upwardly through a slot 51 in the chassis frame plate 13. A

large washer 52 is supported on the base of the rod 50 and in turn supports a tubular guide member 54 of low friction plastic material which is sized to pass freely through the slot 51.

A compression spring 55 fits loosely over the guide 54 and is supported at its lower end by the washer 52. A second large washer 56 is too large to pass through the slot 51 and has a central opening sized to receive the spring guide 54, but not the spring 55, freely therethrough. The spring 55 is thus confined between the washers 51 and 56 so that it exerts a constant biasing force between the frame plate 13 and the power unit 20 which urges the latter in clockwise direction on pivot shaft 25 as viewed in Fig. 2.

It is normal practice in the use of a wheeled stretcher to move it with its foot end leading, so that in the event of a collision, the head of the patient will be as remote as possible from the point of impact. The head end of the stretcher is therefore provided with guide means, comprising a pair of handles 60 mounted on conveniently located components of the structure supporting the bed 10. The handles 60 are connected by a cross bar 62 on which in turn are mounted an On-Off key switch 65 for the power to drive motor 40, and a joy stick 66 for controlling the speed and direction of motor 40, as described hereinafter.

Since the axis of driving wheel is normal to the length of the stretcher, its driving force is lengthwise of the stretcher, but the stretcher can be steered, by means of handles 60, by swinging the head end of the stretcher to one side or the other about a vertical axis centered on the wheel 30 so that the casters 12 at the head end of the stretcher

can turn on the vertical axes of their connections to the frame bar 16. There are times, however, when it is necessary to move the stretcher at right angles to its length, such as when moving it into sidewise relation with a bed. Such sidewise movement would be difficult so long as the driving wheel 30 is in contact with the floor, and means are therefore provided for lifting power unit 20 to a position wherein the wheel 30 is free of the floor, and for releasingly latching it in that raised, inoperative position.

Referring to Fig. 2, a lift lever arm 70 is mounted on a pivot shaft 71 having its opposite ends mounted near the upper ends of the same pair of tubes 26 on which the power unit is pivotally mounted. A lift bar 72 extends freely through a slot 73 in the frame plate 13 and is pivotally connected at 74 to the inner end of lever arm 70 and at 75 to a clevis 76 welded on the top of the frame cross member 23. A keeper or pawl member 77, consisting of a rectangular piece of flat bar stock, is welded to one side of the lift bar 72.

As is apparent from Fig. 2, counterclockwise movement of the lever arm 70 resulting from downward pressure on its outer end will have the effect, through lift bar 72, of lifting the entire drive unit 20 against the force of spring 55, and releasable means are provided for latching the parts in this position. More specifically, a latching member 80 of flat bar stock is mounted for guided sliding movement on top of the frame plate 13 by means of a bolt 81 which extends through a slot 82 in plate 13, and another bolt 83 which projects upwardly from the plate 13 through a slot 84 in the member 80.

As shown in Figs. 4 and 5, the plate 13 is also provided with a channel-shaped slot 85, and a knob 86 includes a stem which passes freely through the slot 85 for sidewise movement between the two ends of this slot. A coil spring 88 is connected between this stem portion of knob 86 and the bolt 81 on member 80. When the knob 86 is at the end 85a of slot 85, the spring 88 will apply a biasing force to member 80 outwardly of the chassis. As shown in Fig. 4, this is the unlatched position, and lift bar 72 is free to move up and down between the limit positions established by contact of the drive wheel 30 with the floor and maximum compression of spring 55.

When the knob 86 is moved to the other end 85b of slot 85, the spring 88 will bias the member 80 inwardly of the chassis, so that its inner end will abut the side of the pawl 77. However, when the lever arm 72 is depressed to raise the power unit, then as soon as the pawl 77 has been raised above the member 80, that member will slip under the pawl 77 to latch the lever arm 72 against movement in the reverse direction, as shown in Figs. 5 and 6, and thereby will prevent the power unit from returning to operative position.

When it is desired to resume driving of the stretcher, the knob 86 is again moved to the end 85a of slot 85. This will not release the latch mechanism, however, because the weight of the power unit coupled with the force of spring 55 will cause the pawl 77 to hold the member 80 by friction in its latched position. In order to release the latch mechanism, it is then necessary first to depress the lever arm 72 to a sufficient extent to release the member 80

for movement to its unlatched position under the biasing force of spring 88. When the arm 72 is then again released, the power unit will move down to its operative, driving position of engagement of the wheel 30 with the floor. For ease of operation, lift arm 70 is preferably provided with a foot pedal 90 on its outer end.

The drive motor 40 is battery-powered, and the related electrical components and circuits are shown diagrammatically in Fig. 7. With the motor 40 of the characteristics already indicated, satisfactory results under tests have been obtained using, as a direct power source, two rechargeable 12-volt batteries 100 of the type sold as Globe Gel/Cell 12-volt batteries. One of these batteries is carried in each of a pair of baskets 101 suspended on the frame tubes 14 and 15, one of which is shown in Fig. 1.

Since the batteries 100 are rechargeable, a recharger 102 is also carried by the stretcher, in one of the baskets 101. Test results have shown that a satisfactory such charger is marketed as Model CCR 12 by Schauer Manufacturing Corp., 45 Alpine Avenue, Cincinnati, Ohio 45242.

The electric control system includes a motor speed and direction controller 105 which is conveniently carried in the basket 101 which does not contain the recharger 102. Satisfactory test results have been obtained using a motor speed controller Model 1203 marketed by Curtis PMC, 6591 Sierra Lane, Dublin, California 94568. Manual control over the operation of the controller 105 is provided by the joy stick 66, an example of a suitable commercially available unit for this purpose being the joy stick control unit JS 4

marketed by Flight Link Control in Altow, Hants, Great Britain.

It should now be apparent that for normal use, a single person can drive and steer the above-described stretcher by controlling its speed and direction of driven movement through manual manipulation of the joy stick 66, with the steering being effected by swinging the head end of the stretcher to one side or the other by means of the handles 60. Power operation of the stretcher will accordingly be available for all transport purposes except when it is necessary to move the stretcher sidewise, e.g. to bring it into accurate side-by-side alignment with a bed or operating table. For such purposes, the power unit 20 is lifted and latched as described, so that the stretcher as a whole can then be maneuvered on its casters 12. Since such manual maneuvering of the stretcher normally involves relatively little actual movement, this also can be readily done by a single person.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

The embodiments of the invention in which an exclusive pr perty or privilege is claimed are defined as follows:

1. A self-propelled stretcher including a chassis, a bed structure on the chassis for supporting a supine patient, and a plurality of casters supporting said chassis for movement along a floor, which is characterized by incorporating a self-contained drive for propelling the stretcher along the floor, comprising:

(a) a driving wheel,

(b) means mounting said wheel on said chassis in frictional engagement with the floor,

(c) drive means including a motor mounted on said chassis in driving relation with said wheel, and

(d) operator controlled means on said chassis for regulating the operation of said motor.

2. A self-propelled stretcher as defined in claim 1 wherein said mounting means includes means for moving said driving wheel into and out of engagement with the floor.

3. A self-propelled stretcher as defined in claim 1 wherein said mounting means comprises a support wherein said driving wheel is journalled, and means for moving said support between lowered and raised positions wherein said wheel is respectively in and out of contact with the floor.

4. A self-propelled stretcher as defined in claim 3 further comprising biasing means effective in said lowered position of said support to maintain pressure engagement between said wheel and the floor.

5. A self-propelled stretcher as defined in claim 3 further comprising a compression spring positioned for compression between said support and said chassis during movement of said support from said lowered position to said raised position and for maintaining pressure engagement between said wheel and the floor in said lower position of said support.

6. A self-propelled stretcher as defined in claim 3 further comprising releasable means for latching said support in said raised position.

7. A self-propelled stretcher as defined in claim 3 further comprising releasable means responsive to movement of said support to said raised position for latching said support in said raised position.

8. A self-propelled stretcher as defined in claim 5 further comprising releasable means responsive to movement of said support to said raised position for latching said moving means in a position holding said support in said raised position.

9. A self-propelled stretcher as defined in claim 7 wherein said moving means includes a lifting member supported in said chassis for up and down movement, and wherein said latching means comprises a latching member mounted on said chassis for movement in a substantially horizontal plane into and out of engagement with the side of said lifting member, selectively operable means for biasing said latching

member toward and away from said lifting member, pawl means on said lifting member and movable therewith between positions above and below the horizontal level of said latching member, whereby when said latching member is biased toward said lifting member during upward movement of said lifting member, said latching member will move to a position beneath said pawl means upon movement of said pawl means to a level above said latching member to latch said support in raised position by holding said panel means against movement to a lower level, and further whereby upon reversal of said biasing means, said pawl and said latching member are held in latching relationship by the load of said support and the parts carried thereby until said lifting member has been lifted.

10. A self-propelled stretcher as defined in claim 5 wherein said moving means includes a lifting member supported in said chassis for up and down movement, and further comprising a latching member mounted on said chassis for movement in a substantially horizontal plane into and out of engagement with the side of said lifting member, selectively operable means for biasing said latching member toward and away from said lifting member, pawl means on said lifting member and movable therewith between positions above and below the horizontal level of said latching member, whereby when said latching member is biased toward said lifting member during upward movement of said lifting member, said latching member will move to a position beneath said pawl means upon movement of said pawl means to a level above said latching member to latch said support in raised position by

holding said pawl means against movement to a lower level, and further whereby upon reversal of said biasing means, said pawl and said latching member are held in latching relationship by the force of said spring until said lifting member has been lifted.

11. A self-propelled stretcher as defined in claim 11 further comprising at least one battery for supplying operating current to said motor, and means on said chassis for supporting said battery.

12. A self-propelled stretcher as defined in claim 10 wherein said battery is rechargeable, and further comprising a recharger for said battery mounted on said chassis.

13. A self-propelled stretcher as defined in claim 11 which has a head end and a foot end, wherein said drive and mounting means therefor are located at said foot end, and further comprising steering means mounted at said head end of said stretcher.

14. A self-propelled stretcher as defined in claim 13 wherein said operator controlled regulating means are located adjacent said steering means for control by the same individual operating said steering means.

FIG - 1

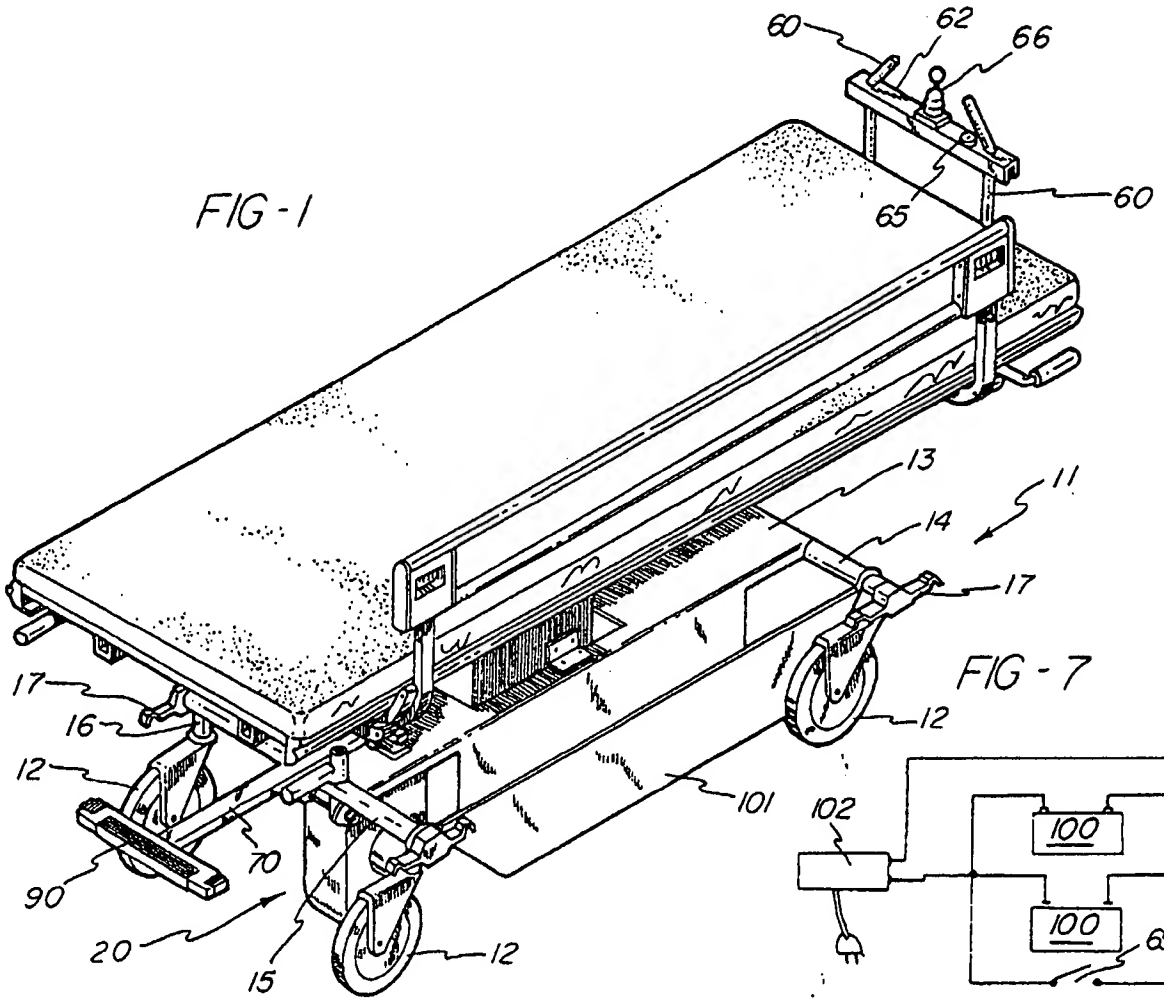

FIG - 7

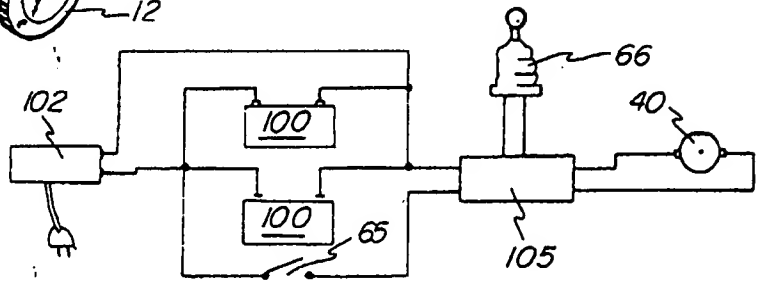

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FIG-2

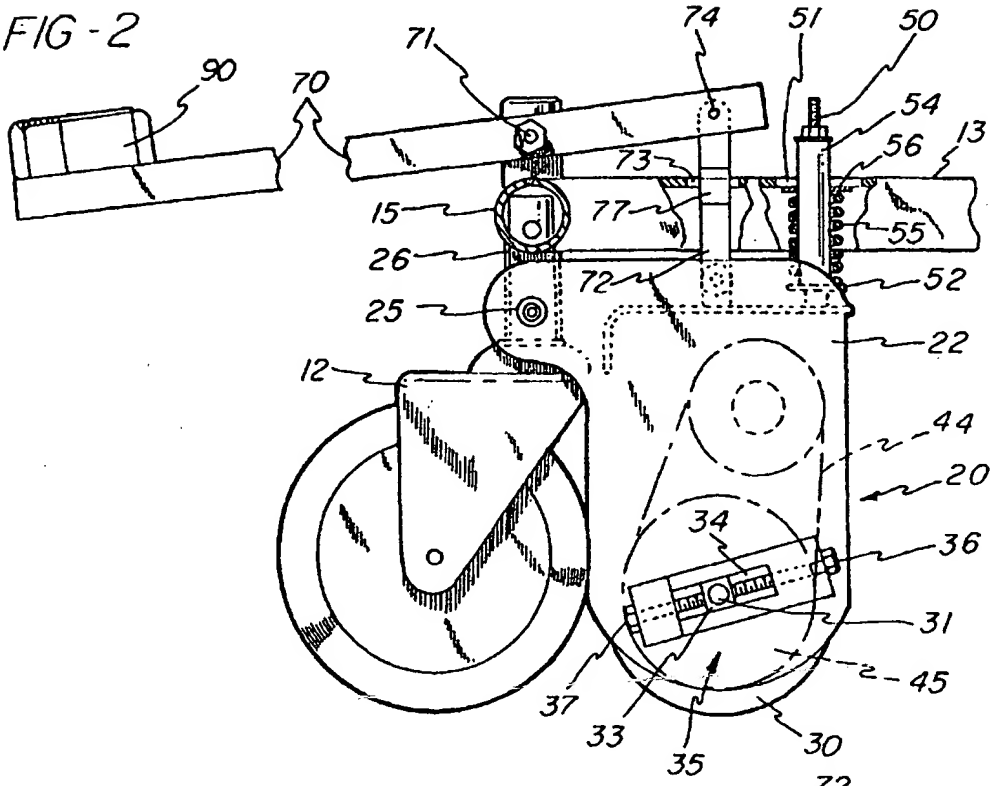

FIG-3

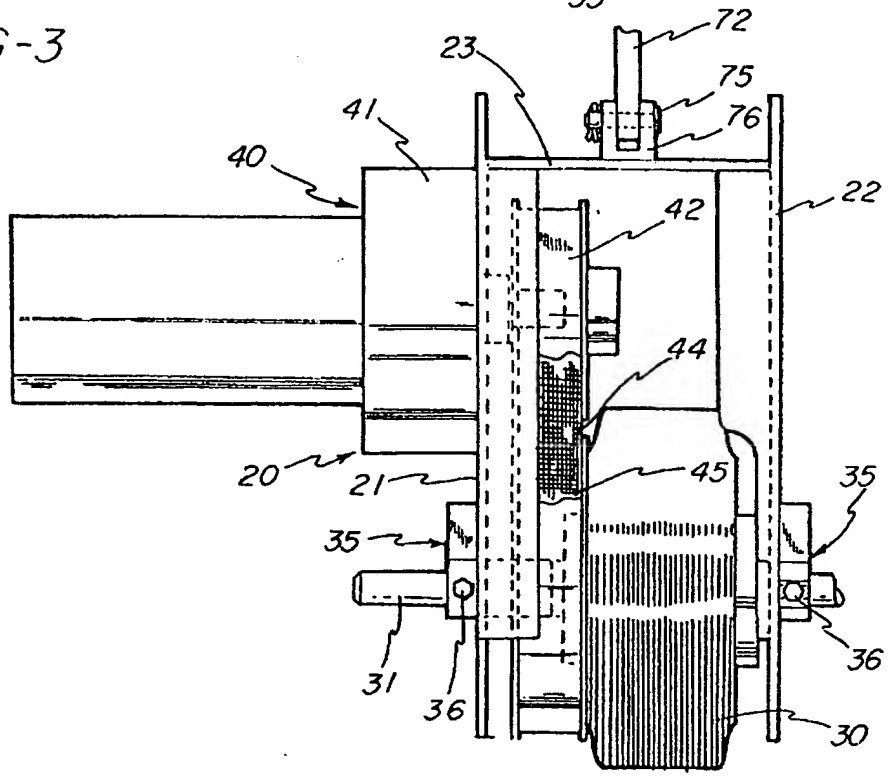

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FIG - 4

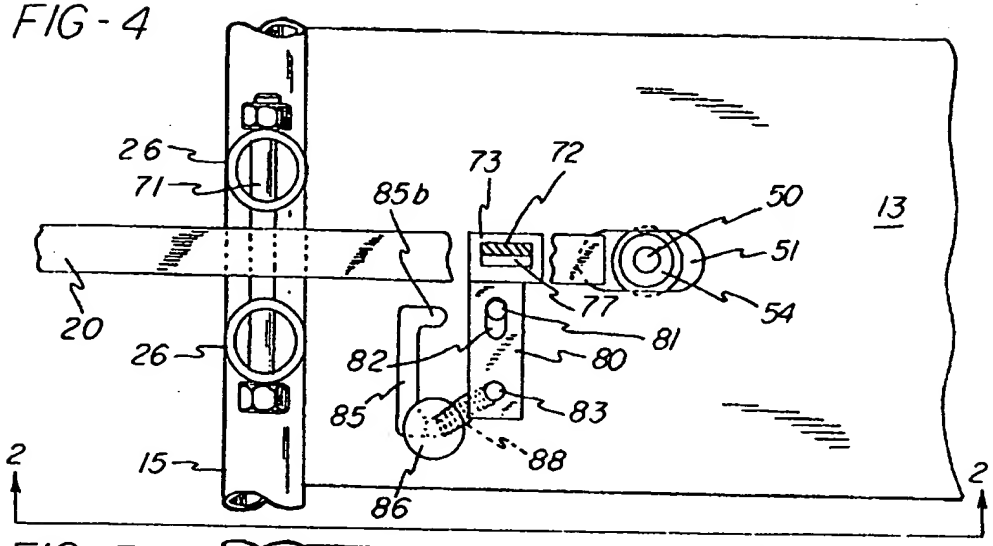


FIG - 5

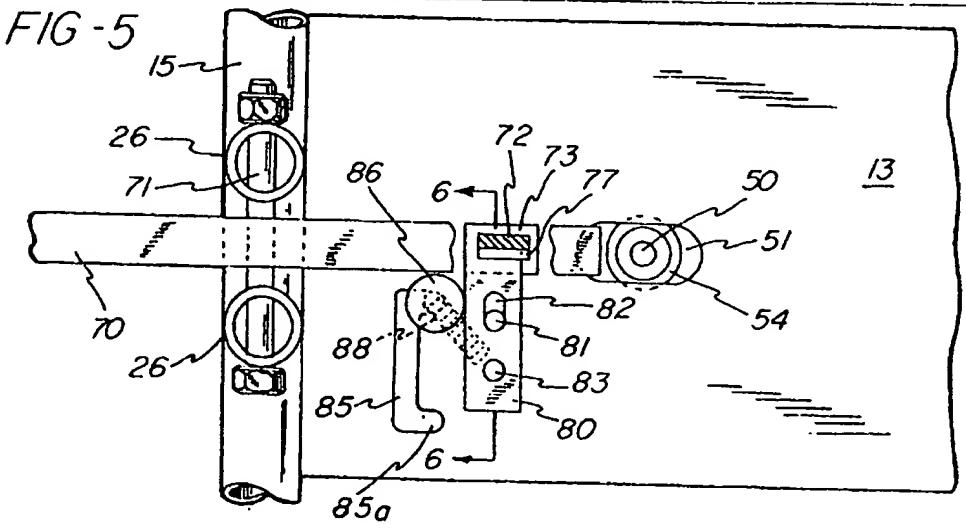
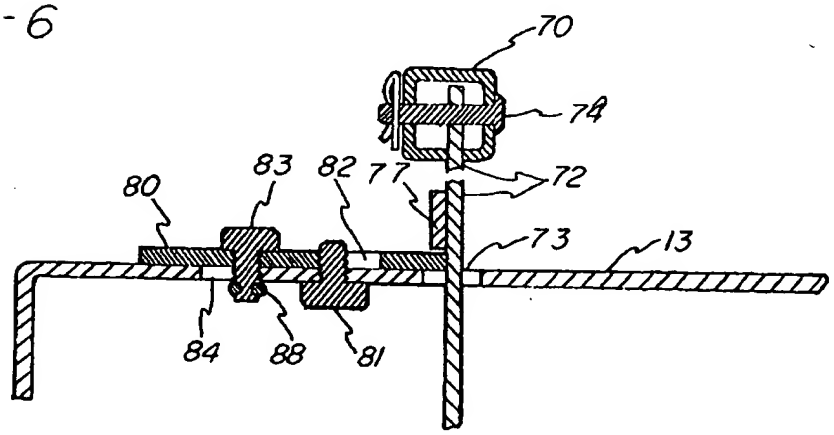


FIG - 6



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